Soil Technologies Corp.
Research and Development Department

Research Report

Title: MICROP Seeding & Conventional Fertilization Compared in Sweet Corn

Location: Ackley, Iowa, on farms owned and operated by Stokely U.S.A.

Principal Investigators: Rick Snively, an agronomist for Stokely U.S.A., Inc.

Crop: Sweet Corn

Date: 1987 and 1988

Abstract: This study investigates the impact of MICROP, a green manure crop derived from microalgae, on sweet corn yields in comparison to conventional fertilization methods. Field trials were conducted in 1987 and 1988 on farms near Ackley, Iowa, overseen by agronomist Rick Snively. The trials utilized a plot size of 0.1 acre with four replications and tested various treatments. In 1987, MICROP demonstrated an increase in yield capacity, indicating its viability as an alternative to conventional fertilization practices, potentially reducing the need for traditional nitrogen-based fertilizers. In 1988, especially when MICROP was combined with nitrogen fertilization without starters, there were indications of a potential reduction in ammonia-based fertilization. These findings demonstrate the scientific validity of MICROP as a sustainable and cost-effective approach to sweet corn cultivation.

MICROP Seeding and Conventional Fertilization Compared In Sweet corn

Data Generation
by
Stokely U.S.A., Inc.

Author: Jim Schaefer

INTRODUCTION:

This study looks at the effects of MICROP, a commercially available non-conventional green manure crop, on sweet corn yields compared to several different conventional fertilization practices. MICROP is composed of single-celled plants called microalgae. It is seeded to the soil surface at the rate of 9.1×10^9 dormant cells (seeds) per acre. The cells germinate in approximately 48 hours and begin to propagate rapidly in the top one inch of the soil surface by cell division. After approximately 30 days of propagation it will have supplied to the soil a plant residue composed of a broad spectrum of polysaccharides, organic acids, plant growth stimulating hormones and nitrogen from microalgal nitrogen fixation processes.

The field trials in this study were established, managed and harvested by Rick Snively, agronomist for Stokely U.S.A., Inc., based in Ackley, Iowa. The trials were geographically located near Ackley, Iowa on farms owned and operated by Stokely U.S.A. contract growers of sweet corn. The experiments were conducted in 1987 and 1988. The planted plot size was 0.1 acre and the harvested plot size was .004 acre, with four replications per treatment. The plot design was strip plots. The common data for each the check and treated areas for each farm are charted and presented herein. A comprehensive definition for each treatment and the check plots is included herein. Note that 1988 was generally recognized as a very droughty year in the geography of the field trials with only 8.75 inches of rain between the plant and harvest dates. The 1987 rainfall was average.

1987 TREATMENTS AND CHECK DEFINED:

Check: No starter fertilizer was used. 133 pounds of actual nitrogen per acre was applied in the NH_3 form, except on the King farm where 165 pounds was applied. NH_3 cost = $13.03/acre, except on the King farm where the NH_3 cost was $16.17/acre.

10-20-10: Two gallons of 10-20-10 per acre with 8 gallons of water per acre was applied at planting and again at the seven leaf stage. The material cost for this fertilizer was $21.00/acre. Also, 133 pounds of actual nitrogen per acre was applied in the NH_3 form, except on the King farm where 165 pounds were applied. NH_3 cost = $13.03/acre, except on the King farm where the NH_3 cost was $16.17/acre.

7-21-7: Ten gallons of 7-21-7 per acre was applied at planting. Material cost for this fertilizer was $7.70/acre. Also, 133 pounds of actual nitrogen per acre was applied in the NH_3 form, except on the King farm, where 165 pounds was applied. NH_3 cost = $13.03/acre, except on the King farm where the NH_3 cost was $16.17/acre.

MICROP: Four ounces per acre of MICROP was used to seed the soil surface, mixed with the herbicide immediately after planting. MICROP material cost = $5.00/acre. In addition, 133 pounds of actual nitrogen was applied per acre in the NH_3 form, except on the King farm where 165 pounds was applied. The NH_3 cost was $13.03/acre, except on the King farm where the NH_3 cost was $16.17/acre.

1988 TREATMENTS AND CHECK DEFINED:

Check: No fertilizer in any form was applied.

10 Pop-Up: Ten gallons of 7-21-7 per acre was applied in the seed furrow. The material cost for this starter fertilizer = $7.70/acre. In addition, 100 pounds of actual nitrogen was applied pre-plant and 40 pounds of actual nitrogen was applied as a side dressing to the crop. The nitrogen fertilizer form was NH_3. The NH_3 cost was $15.37/acre.

5 Pop-Up: Five gallons of 7-21-7 per acre was applied in the seed furrow. The material cost for this starter fertilizer = $3.85/acre. In addition, 100 pounds of actual nitrogen was applied pre-plant and 40 pounds of actual nitrogen was applied as a side dressing to the crop. The nitrogen fertilizer form was NH_3. The NH_3 cost was $15.37/acre.

0 + NH_3: No starter fertilizer was used. 100 pounds of actual nitrogen was applied pre-plant and 40 pounds of actual nitrogen was applied as a side dressing to the crop. The nitrogen fertilizer form was NH_3. The NH_3 cost was $15.37/acre.

MICROP: Ten gallons of 7-21-7 per acre was applied in the seed furrow. The material cost for this starter fertilizer = $7.70/acre. In addition, 4 ounces per acre of MICROP was used to seed the soil surface immediately after row cultivation. The material cost for MICROP = $5.00/acre. Also, 100 pounds of actual nitrogen was applied pre-plant and 40 pounds of actual nitrogen was applied as a side dressing to the crop. The nitrogen fertilizer form was NH_3. The NH_3 cost was $15.37/acre.

0 + M: No starter fertilizer was used. 4 ounces per acre of MICROP was used to seed the soil surface immediately after row cultivation. The material cost for MICROP = $5.00/acre. Also, 100 pounds of actual nitrogen was applied preplant and 40 pounds of actual nitrogen was applied as a side dressing to the crop. The nitrogen form was NH_3. The NH_3 cost was $15.37/acre.

1987 COMPARATIVE YIELD RESULTS IN U.S. TONS/ACRE

TREATMENTS

Farm	Check	10-20-10	7-21-7	MICROP	L.S.D.
Struthoff	6.773	7.200	7.636	9.106	.225
Thies	5.971	6.094	6.677	7.821	.189
King	5.891	5.241	5.908	7.200	.176

1988 COMPARATIVE YIELD RESULTS IN U.S. TONS/ACRE

TREATMENTS

Farm	Check	10 Pop-Up	5 Pop-Up	O + NH_3	MICROP	O + M
Bower	4.256	4.483	4.912	4.988	5.283	5.366

1987 CONCLUSIONS:

Struthoff Farm:

1) All treatments increased the yield over the check. The greatest yield enhancement was produced by the MICROP treatment.

2) The MICROP treatment could be used as an effective substitute for the starter and post-planting fertilizer routines examined.

3) Based on a value for sweet corn "at the farm" at $35.00/ton, the economic return from increased production per treatment is as follow:

Treatment	Increased Yield (Ton/Acre)	Gross Value of Yield Increase		Material Cost Per Acre		Profit Per Acre
10-20-10	0.427	$14.94	-	$21.00	=	($6.06)
7-21-7	0.863	$30.20	-	$ 7.70	=	$22.50
MICROP	2.333	$81.65	-	$ 5.00	=	$76.65

4) Though not directly measured on this farm, it can be suggested form this work that MICROP could be used to not only replace the starter and post-planting fertilizations but also potentially a significant percentage of the NH_3 used on all plots, including the check, a method to potentially save money for the producer in the area of total fertility cost.

Thies Farm:

1) All treatments increased the yield over the check. The greatest yield enhancement was produced by the MICROP treatment.

2) The MICROP treatment could be used as an effective substitute for the starter and post-planting fertilizer routines examined.

3) Based on a value for sweet corn "at the farm" at $35.00/ton, the economic return from increased production per treatment is as follows:

Treatment	Increased Yield (Ton/Acre)	Gross Value of Yield Increase		Material Cost Per Acre		Profit Per Acre
10-20-10	0.123	$ 4.30	-	$21.00	=	($16.70)
7-21-7	0.706	$24.71	-	$ 7.70	=	$17.01
MICROP	1.850	$65.75	-	$ 5.00	=	$59.75

4) It could be suggested by this work, though not directly measured on this farm, that MICROP could potentially substitute for a significant percentage of the total fertilization, thus producing a potential savings to the producer in the area of total fertility cost.

King Farm:

1) The 7-21-7 and MICROP treatments produced a yield increase when compared to the check.

2) The MICROP treatment could be used as an effective substitute for the starter and post-planting fertilizer routines examined.

3) Based on a value for sweet corn "at the farm" at $37.00/ton, the economic return from increased production per treatment is as follows:

Treatment	Increased Yield (Ton/Acre)	Gross Value of Yield Increase		Material Cost Per Acre		Profit Per Acre
10-20-10	(0.6500)	($22.75)	-	$21.00	=	($43.75)
7-21-7	0.017	$ 0.60	-	$ 7.70	=	($ 7.10)
MICROP	1.309	$45.81	-	$ 5.00	=	$40.81

1988 CONCLUSIONS:

Bower Farm:

1) All treatments increased yields when compared to the check. The greatest yield increase was under the MICROP with no added starter treatment, labels O + M.

2) The MICROP treatment could be used as an effective substitute for the starter fertilizer concepts examined.

3) Based on a value for sweet corn "at the farm" at $35.00/ton, the economic return from increased production per treatment is as follows:

Treatment	Increased Yield (Ton/Acre)	Gross Value of Yield Increase		Material Cost Per Acre		Profit Per Acre
10 Pop-Up	0.227	$ 7.95	-	$23.07	=	($15.12)
5 Pop-Up	0.656	$22.96	-	$19.22	=	$ 3.74
O + NH_3	0.732	$25.62	-	$15.37	=	$10.25
MICROP	1.027	$35.95	-	$28.07	=	$ 7.88
O + M	1.110	$38.85	-	$20.37	=	$18.48

4) When comparing the treatments labeled "O + NH_3" and "O + M", it was observed that an additional 0.378 tons of sweet corn was produced when MICROP is added to the NH_3 alone, no starter utilized. This 0/378 tons of increased production equals 51% of the increase for the "O + NH_3" (NH_3 fertilization alone versus the check) treatment over the check, which was an increase of 0.732 tons. It may be directly concluded from this observation that MICROP is an effective yield enhancer when used in conjunction with regular NH_3 fertilization, without starters. From this same observation, it may be inferred, though it was not directly measured in this study, that the MICROP supplementation to NH_3 fertilization could be used as a potential method to reduce the use of NH_3 fertilization by up to 51%.